

Capillary Membrane Distillation and Photocatalysis for Water Reclamation During Space Travel, Phase I

Completed Technology Project (2018 - 2019)



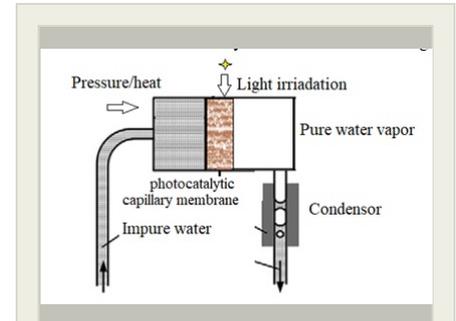
Project Introduction

Human habitation of space hinges on the creation of a safe and healthy environment to support life. Water, along with oxygen and food, is a critical life sustaining factor. Shipping of water from earth for extended space missions is impossible because of the unwieldy nature of transport, both in terms of costs and logistics involved. Thus recycling and reclamation is the only way to ensure that every drop of water counts. MMI will develop a photocatalytic capillary membrane distillation system for the reclamation of water from urine and other forms of impure water that are produced by human life in space. When installed in a spacecraft/space station, this will reduce or eliminate the need to transport water from earth. The incorporation of the photocatalytic unit to decompose the organic impurities in water will prevent fouling of the capillary membrane, thus enabling long term use of the reclamation unit during space travel.

Anticipated Benefits

Wastewater recycling/reclamation is crucial for successful long-duration space travel. Water available for recycling comes from three primary sources: humidity condensate, wash-water, and urine. **The photocatalytic capillary membrane distillation system will be integrated into Life Support and Habitation Systems of NASA that support Environmental Control and Life Support Systems (ECLSS), Extravehicular Activity (EVA) Systems, Advanced Food Technology and Biological Life Support.**

The water treatment unit can be used to purify drinking water supplied by public water suppliers as well as private bodies. It can also be used as a portable unit to convert brackish water into drinkable water at remote locations. The technology may also be extended to treat wastewater from industrial operations especially in fracking or from rest stops, commercial buildings and apartments



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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Materials Modification, Inc.	Lead Organization	Industry Small Disadvantaged Business (SDB)	Fairfax, Virginia
 Marshall Space Flight Center (MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	Virginia

Project Transitions

 **July 2018:** Project Start

 **February 2019:** Closed out

Closeout Documentation:

- Final Summary Chart (<https://techport.nasa.gov/file/141298>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Materials Modification, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

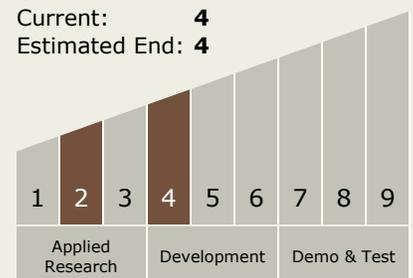
Carlos Torrez

Principal Investigator:

Tirumalai S Sudarshan

Technology Maturity (TRL)

Start: **2**
 Current: **4**
 Estimated End: **4**

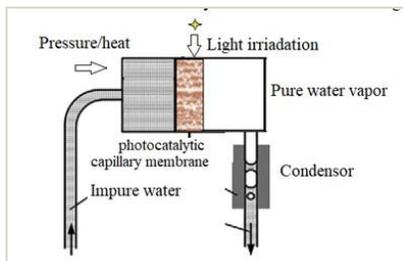


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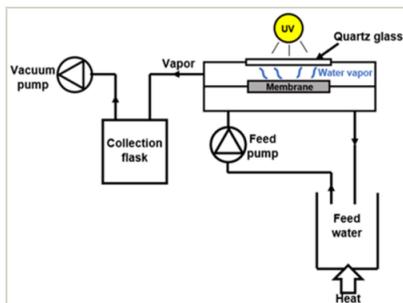
Images



Briefing Chart Image

Capillary Membrane Distillation and Photocatalysis for Water Reclamation During Space Travel, Phase I

(<https://techport.nasa.gov/image/131907>)



Final Summary Chart Image

Capillary Membrane Distillation and Photocatalysis for Water Reclamation During Space Travel, Phase I

(<https://techport.nasa.gov/image/136349>)

Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
 - └ TX06.1 Environmental Control & Life Support Systems (ECLSS) and Habitation Systems
 - └ TX06.1.2 Water Recovery and Management

Target Destinations

Earth, The Moon, Mars